4,500 feet, reported 78 percent of the water content for the same period. The amount of snow in that portion of the Cascades drained by the Columbia River exceeded by several inches the amount recorded last year. Snow depths in the elevated districts south of the international line ranged from normal to considerably above, according to reports, and was generally above normal in water content, except in the upper Snake, where snow depths and water content were sufficient to sustain the highest average summer flow at Weiser, Idaho, since 1928.

Due to low average temperatures over the entire upper Columbia drainage during the winter and early spring, the average stage of the Columbia and its tributaries was considerably lower than normal. In January to April, inclusive, it was the lowest since 1931, when, on account of a considerable deficiency in precipitation during 1930, the river stages were abnormally low. The Dalles, Oreg., reported a stage of −3.5 feet on February 10, 1936. This exceeds by 1 foot the previous low record.

Temperatures continued low the first part of April, with freezing nights over the entire snowfield. About the 10th mean temperatures rose sharply, except over the northern portion of the Canadian drainage, and by the middle of April a considerable amount of the lowest snow had melted and all streams were rising rapidly. A stage of 15.2 feet was reached at Lewiston, Idaho, on the Snake River, on April 25; the highest stage (on May 16) exceeded this by only 1.2 feet. Mean temperatures fell considerably the middle of May, and night temperatures were near freezing on May 15 and 16. Except for a very slight rise in the Snake River the first part of June, caused by heavy precipitation and a decreased demand for irrigation water in southern Idaho, the stage fell steadily after May 16. The effective snow cover for increased run-off had been exhausted by the warm weather the last half of April and the first half of May.

Abnormally high temperatures in the interior of western Canada caused the Columbia to continue to rise. Crest stages were reached in the upper Columbia the first week in June and, accompanied by a near stationary stage in the Snake River, they advanced as far downstream as Vancouver, Wash., and Portland, Oreg., by the 11th. However, most apprehension was over when the Snake River failed to rally with the high temperatures the last week of May. Experience has shown that it is necessary to have both the upper Columbia and Snake Rivers at high stages, with a tendency to rise or rising, to produce a serious flood in the lower river. When one is rising and the other falling the effect is compensating. The hydrograph below the confluence of the two rivers is considerably flattened, and very much reduced crest stages result.

The damage resulting from the high water this season is thought to have been almost negligible. Ample warnings were issued. Tentative forecasts of 20 feet for Portland and 35 feet for The Dalles were made at the end of March. Shipping interests were advised promptly, so that the lower docks could be evacuated without damage to cargo. It was necessary for some farmers on the lowlands to delay planting and for others to purchase a small additional amount of feed; however, this is expected almost annually.

Table of flood stages during June 1936

[All dates in June, unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE	*Feet*			*Feet*	
Cape Fear: Lock No. 2, Elizabethtown, N. C.	20	26	26	20.0	26.
MISSISSIPPI SYSTEM					
Arkansas Basin					
Cimarron: Perkins, Okla.	11	6	7	12.8	6.
North Canadian:					
Woodward, Okla.	5	2	2	6.0	2.
		5	8	8.0	6.
Canton, Okla.	6	6	9	8.5	7.
Yukon, Okla.	8	May 27	18	11.4	11.
East Oklahoma City, Okla.	14	10	12	15.3	12.
Canadian: Union, Okla.	6			9.0	5.
Arkansas: Great Bend, Kans.	5	3	4	5.8	3.
WEST GULF OF MEXICO DRAINAGE					
Guadalupe: Victoria, Tex.	21	May 23	2	29.6	May 25.
Rio Grande: Eagle Pass, Tex.	16	29	29	20.2	29.
GULF OF CALIFORNIA DRAINAGE					
Colorado Basin					
Eagle: Eagle, Colo.	5	May 30	1	5.3	May 31.
Roaring Fork: Carbondale, Colo.	5	May 15	2	6.2	May 30, June1
		9	14	5.4	12.
PACIFIC SLOPE DRAINAGE					
Columbia Basin					
Willamette: Portland, Oreg.	18	5	14	19.7	10, 11.
Columbia: Vancouver, Wash.	15	May 6	21	20.4	10, 11.

WEATHER ON THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, I. R. TANNEHILL in Charge]

NORTH ATLANTIC OCEAN, JUNE 1936

By H. C. HUNTER

Atmospheric pressure.—Near the British Isles and the western coasts of Europe and northern Africa the pressure averaged greater than normal. However, most of the Atlantic area had pressure less than normal, particularly the vicinity of Bermuda and the regions to southwestward toward the Greater Antilles, where readings were seldom as high as normal until after the 21st.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, June 1936*

Stations	Average pressure	Departure	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Julianehaab, Greenland	29.79	−0.07	30.18	25	29.44	14
Reykjavik, Iceland	29.86	−.02	30.32	1	29.20	11
Lerwick, Shetland Islands	30.00	+.20	30.35	19	29.55	6
Valencia, Ireland	30.01	+.01	30.25	5	29.61	30
Lisbon, Portugal	30.12	+.09	30.50	5	29.75	20
Madeira	30.12	+.05	30.27	4	29.96	1
Horta, Azores	30.24	.00	30.51	6, 7, 8, 9	29.82	26
Belle Isle, Newfoundland	29.87	+.01	30.36	19	29.08	17
Halifax, Nova Scotia	29.92	−.05	30.34	24	29.28	2
Nantucket	29.91	−.07	30.29	23	29.44	28
Hatteras	29.94	−.07	30.20	26	29.66	28
Bermuda	30.02	−.11	30.22	27	29.66	16
Turks Island	29.94	−.09	30.08	26	29.79	16
Key West	29.90	−.09	30.09	30	29.58	15
New Orleans	29.92	−.06	30.12	26	29.72	1

NOTE.—All data based on a. m. observations only, with departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

The extremes of pressure so far reported from vessels are 30.70 and 29.13 inches, the former mark being recorded on the British steamship *Goolistan*, during the forenoon of the 8th, near latitude 43° N., longtiude 24° W., and the latter on the American steamship *Scanmail*, at 11 p.m., the 10th, at about 57° N., 22° W.

Cyclones and gales.—There were about as many reports of gales as usual in June. Whole gales (force 10) occurred several times, in various parts of the ocean, but in no case near or over tropical waters.

The storm most notable for its effects along the chief steamship lane to northern Europe was located between Bermuda and Newfoundland on the 1st, and moved eastward then toward the east-southeast to about the fortieth meridian on the 2d; thereafter it was practically stationary, and by the 5th had almost filled up.

During about a fortnight thereafter the few strong winds over Atlantic waters east of the fiftieth meridian were mostly related to the unusually high pressure prevailing in the region north of the Azores. The Belgian steamship *Kambove*, from Argentina to the English Channel, reported intensified northeast trade winds from the

6th to the 9th, when near the Cape Verde and Canary Islands. During the next few days, low pressure near Iceland, in connection with the HIGH, caused whole gales along part of the far-northern route, near latitude 55°, longitude 20°.

Elsewhere in this REVIEW appears an account of three tropical disturbances; all developed in the Gulf or western Caribbean, and only the first of them affected the main Atlantic Ocean. The first disturbance crossed southern Florida on the 15th and then traveled northeastward rapidly, passing northwest of Bermuda, and becoming, by the 16th, part of a north-south LOW system. On the 17th the LOW was well consolidated, with its center near the Strait of Belle Isle, whence it traveled northward to Greenland, the pressure at Godthaab on the 18th falling to 28.98 inches.

During the final week of June there were a few isolated cases of intense local storms. On the 24th vessels and airplanes south of the Dominican Republic reported squally conditions, but no cyclonic development was detected. The chief of the Meteorological Service at Santo Domingo reports that the squalls were accompanied by heavy sea swells that caused the death of 12 fishermen in small boats. A few lives were also lost at San Pedro de Macoris as a result of heavy seas. The British freighter *Baron Ogilvy* went aground at the mouth of the Nizao River and was a total loss.

At an early hour of the 29th the American steamer *Mariana*, when about 160 miles east of Hatteras, met a vigorous thunderstorm with westerly squalls estimated at force 10. Later that day or on the 30th, three vessels noted westerly gales over waters to northeastward of the *Mariana's* location, one of the three encountering a whole gale.

Fog.—Fog was unusually prevalent over many northern portions of the North Atlantic. In the vicinity of the British Isles and to southwestward half way to the Azores there were many days with fog, especially about the 10th and the 20th, and during the final few days of June. However, almost no fog was met in the eastern and central portions of the ocean anywhere to southward of the forty-fifth parallel, while along the chief route to the English Channel practically no fog was encountered between the twenty-fifth and fortieth meridians.

In the Grand Banks region there was about the normal amount of fog; but to southwestward, as far as Cape Cod, fog was very prevalent, the two 5°-squares 40 to 45° N., 60 to 70° W., each having records of 20 days' occurrence. To the southwestward of Cape Cod there was considerable fog, but the first half of the month included practically all of it, while as usual in June there was scarcely a single report of fog near or to southward of Cape Hatteras.

Four disasters due to fog were reported as occurring during the 6th to 9th, fortunately without loss of life. One steamer grounded near Cape Race, Newfoundland, and a schooner on an island in the Gulf of St. Lawrence, each becoming a total loss. During the evening of the 9th two steamships collided off Sea Girt, N. J., one being greatly damaged but being towed to harbor. The fourth accident was a less serious collision in the lower St. Lawrence River.

OCEAN GALES AND STORMS, JUNE 1936

Vessel	Voyage		Position at time of lowest barometer		Gale began June	Time of lowest barometer June	Gale ended June	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Inches*					
West Quechee, Am. S. S.	Galveston	Liverpool	42 40 N.	42 35 W.	2	4p, 2	2	29.61	ENE.	NE, 10	NE.	NE, 10	E-NE.
Cavina, Br. S. S.	Kingston	Avonmouth	42 42 N.	42 59 W.	2	8p, 2	2	29.58	NE.	NNE, 8	NE.	NNE, 8	NE-NNE-NE.
Lekhaven, Du. S. S.	Galveston	Bremen	41 30 N.	44 40 W.	2	2a, 3	3	29.75	NNE.	NNW, 8	NE.	NNW, 9	Steady.
Lustrous, Br. S. S.	Port Arthur	Amsterdam	41 00 N.	42 10 W.	2	8p, 3	3	29.61	NNW.	N, 6	NE.	NNW, 8	NW-NE.
Kambove, Belg. S. S.	Buenos Aires	Antwerp	8 28 N.	28 20 W.	6		9		NE.		NE.	NE, 7	None.
Boskoop, Du. S. S.	Cristobal	Liverpool	39 35 N.	42 40 W.	4	1p, 4	4	29.69	NW.	NE, —	ENE.	N, 8	NNW-NE.
Frode, Dan. S. S.	New York	Oslo	54 22 N.	33 20 W.	9	Mdt, 9	10	29.19	SE.	W, —	NW.	WNW, 10	SW-W.
McKeesport, Am. S. S.	Dundee	Boston	56 10 N.	23 15 W.	10	4p, 10	11	29.36	SSE.	WSW, 9	W.	WNW, 10	SSW-WNW.
West Conas, Am. S. S.	Glasgow	New Orleans	54 06 N.	11 50 W.	14	8a, 14	15	29.68	WSW.	W, —	W.	W, 8	SSW-W.
Mayari, Pan. S.	Boston	Banes, Cuba	25 46 N.	73 08 W.	15	2a, 16	16	29.57	S.	W, 8	N.	W, 8	SSW-W-N.
Duquesne, Am. S. S.	Rotterdam	New Orleans	29 21 N.	70 24 W.	15	6a, 16	16	29.46	SSE.	N, 7	N.	S, 8	S-Var.-N.
Sundance, Am. S. S.	Terneuzen	Newport News	[2] 38 57 N.	56 58 W.	16		18	29.75	SSE.	NNW, 7	NNE.	SSE, 9	SSE-NNW-NNE.
New York, Ger. S. S.	Cherbourg	New York	42 00 N.	54 48 W.	17	5p, 17	18	29.69	SSE.	S, 8	N.	SSE, 8	S-N.
Themisto, Du. S. S.	Montreal	Antwerp	52 20 N.	51 30 W.	17	6p, 17	17	[2] 29.51	S.	S, 8	WNW.	S, 9	S-WNW.
Exchester, Am. S. S.	Lisbon	New York	40 20 N.	17 13 W.	19	8p, 19	20	29.48	SW.	W, 9	NNW.	W, 9	WSW-NW.
Cayo Mambi, Am. S. S.	Puerto Mexico	New Orleans	[2] 23 58 N.	91 34 W.	19	9p, 19	20	29.52	NNW.	Var., 2	E.	E, 8	NW-Var.-E.
Venezuela, Du. S. S.	Barbados	Plymouth	45 10 N.	19 40 W.	19	6a, 20	20	29.57	NW.	N, 6	NNE.	NNW, 8	NNW-NNE.
Exchester, Am. S. S.	Lisbon	New York	[2] 41 59 N.	38 57 W.	24	4p, 24	25	29.98	NW.	NW, 4	NNW.	NNW, 8	Steady.
Mariana, Am. S. S.	Jobos, P. R.	do	[2] 35 26 N.	72 10 W.	29		29		SW.		W.	W, 10	SW-W.
Laurent Meeus, Belg. M. S.	Amsterdam	Houston	38 56 N.	57 57 W.	28	8a, 29	30	29.62	SW.	SW, 9	SW.	SW, 9	
Exchester, Am. S. S.	Lisbon	New York	41 16 N.	57 28 W.	28	10a, 29	30	29.58	WSW.	SW, 8	WNW.	SW, 10	SW-W.
New Brunswick, Br. S. S.	Dakar	Boston	37 50 N.	63 10 W.	29	Mdt. 30	30	29.73	SW.	SW, 8	Var.	SW, 8	SW-Var.
NORTH PACIFIC OCEAN													
Golden Sun, Am. S. S.	San Francisco	Yokohama	38 07 N.	178 00 E.	[1] 31	3p, [1] 31	1	29.47	S.	SW, 9	N.	NW, 10	S-WSW.
Golden Dragon, Am. S. S.	do	do	37 06 N.	154 07 E.	1	4p, 1	2	28.92	SE.	SW, 10	NW.	W, 11	S-W.
Bronxville, Nor. M. S.	Santo Nino	Los Angeles	[2] 37 08 N.	161 00 E.	1	2a, 2	3	29.27	SSE.	WSW, —	NW.	SW, 11	SW-WSW-W.
Golden Sun, Am. S. S.	San Francisco	Yokohama	37 48 N.	171 18 E.	2	11a, 2	3	29.53	SSE.	SSE, 10	WNW.	SSE, 10	SSE-SW.
Golden Hind, Am. S. S.	Dairen	San Francisco	31 35 N.	171 40 E.	2	2p, 2	2	29.61	S.	S, 8	W.	S, 8	S-W.
Nordhval, Dan. M. S.	Vancouver, B. C.	Balboa	[2] 12 39 N.	92 38 W.	9	8a, 9	9	[2] 29.18	ENE.	E, 9	SW.	SSE, 10	ENE-S.
Constance Chandler, Am. S. S.	Los Angeles	do	13 15 N.	93 55 W.	9	4p, 9	10	29.53	NW.	NW, 5	S.	SW, 10	NW-SW.
Ensley City, Am. S. S.	Balboa	Los Angeles	14 00 N.	94 30 W.	12	—, 12	12	29.67	N.	N, 7	NW.	N, 8	N-NW.
Aymeric, Br. S. S.	Los Angeles	Kobe	30 03 N.	162 32 E.	11	6a, 13	14	29.58	SSW.	NNE, 6	NE.	NE, 8	S-Var-NE.
Empress of Canada, Br. S. S.	Honolulu	Victoria, B. C.	41 20 N.	136 58 W.	16	4a, 16	16	29.65	W.	W, 7	W.	W, 8	
Steel Ranger, Am. S. S.	do	Balboa	13 58 N.	102 17 W.	22	11a, 22	23	29.49	NNW.	SW, 8	S.	SW, 8	NW-SW.
Fernlane, Nor. M. S.	Los Angeles	Yokohama	42 36 N.	175 47 E.	24	Mdt., 24	25	29.65	S.	SSW, 7	W.	W, 8	S-W.
Pres. Jackson, Am. S. S.	Seattle	do	51 44 N.	171 40 W.	25	2p, 25	26	29.53	SSW.	SW, 8	SW.	SW, 8	
Fernlane, Nor. M. S.	Los Angeles	do	39 03 N.	152 03 E.	29	9p, 29	30	29.65	S.	WSW, 9	SW.	WSW, 9	WSW-SW.

[1] May.
[2] Position approximate.
[3] Barometer uncorrected.